The Superposition of Surface-Parallel Solar Convective Systems Above Surface-Perpendicular Convective Systems and Their Association with Coronal Mass Ejection Risk

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Introduction

Although there is a growing consensus amongst astronomers that Coronal Mass Ejections (CMEs) are the result of decreases in the magnetic field strength of the Sun in select zones, not all local dips in field strength lead to CMEs. A cogent theory is required to explain the dynamics of CMEs which explains this inconsistency.

Abstract

Although Coronal Holes (areas of decreased activity at the surface of the Sun) have long been studied, their relationship to CMEs, if any, is poorly understood. Sunspots are known to correlate with increased overall activity and these spots could be thought of as very small coronal holes in close proximity to one another. It stands to reason that areas of decreased activity being found to be in close collocation with areas of increased activity is to be expected during a time of increased overall activity, not unlike the way in which the surface of boiling water becomes more turbulent as temperature increases.

The inconsistent relationship between a weakening local magnetic field and a CME, I propose, lies in the requirement that convective systems of opposed direction be stacked upon one another. As depth within the body of the Sun increases, so does temperature and activity level. Areas wherein activity is greater feature efficient convective systems which ferry plasma toward the surface and back down again in the direction of the core repeatedly, like a cyclone in which the rotational direction is perpendicular to rather than parallel with the surface.

The surface of the Sun features, I would offer, areas in which plasma currents can become parallel with the surface of the Sun, leading to gradually decreasing temperatures insufficient to maintain the fission-fusion-fission cycle which permits for energy to be generated, more or less, endlessly. These areas tend to exude lesser magnetism than areas of increased activity and can expand to become Coronal Holes depending upon how broad-based the area of decreased activity may be.

When a surface-perpendicular current or Altitudinal Current, if you will, passes just beneath a surface-parallel current, the result is that an area of increased energy is positioned in an area of decreased magnetic confinement. It is this combination of increased sub-surface activity/temperature and reduced magnetic field strength which triggers a CME.

Conclusion

In order to make use of this insight, one must be able to measure the flow direction and speed of plasma within the Sun. Although we can estimate activity level by observing spectral emissions, these emissions tend to represent the average of activity levels at every depth of the Sun and are not specific to a given depth.

In order to determine the flow direction and speed of plasma at depths of 500+ miles beneath the surface, RADAR should be utilized in order to exploit the Doppler Effect to take measurements of this flow direction. As of this moment, we lack any instruments which employ active electromagnetic emission to take measurements of solar activity. Just as rotation consistent with tornadic activity can be detected using this effect, it should be possible to deploy active RADAR systems into heliostationary orbits around the Sun in order to detect the telltale sub-surface currents which prognosticate flares.